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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/069,668 04/29/98 AHN

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021186 MMC2/1016
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EXAMINER

COLEMAN, W

ART UNIT

PAPER NUMBER

2823

DATE MAILED:

10/16/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/069,668

Applicant(s)

AHN ET AL.

Examiner

W. David Coleman

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 August 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 and 32-39 is/are pending in the application.
- 4a) Of the above claim(s) 29 and 30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-28 and 32-39 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed August 13, 2001 have been fully considered but they are not persuasive.
2. Applicants contend that the combined teachings of Tsai, U.S. Patent 5,235,204 and Wolf, "Silicon Processing for the VLSI ERA", Vol. 2 (Process Integration), Lattice Press, 1990, pp. 116-117 and 126-127 teaches away from Applicants claimed invention. Specifically "Wolf does not teach or suggest cross-diffusing silicon into aluminum to prevent junction spiking."
3. In response to Applicants contention that Wolf teaches away from Applicant's invention, please see section 3.5.2.2, pp. 126 of Wolf. The support for cross-diffusion of a metal is found in this particular section by use of a sacrificial barrier. Wolf states that, "silicon from the polysilicon (rather from the substrate) is transported into the aluminum, Al." Furthermore, void formation (i.e., also known as electromigration) and junction spiking is prevented. It is well known in the art that when one distinct material is transported into another material is cross diffusion.
4. Regarding the status of claims 29 and 30, these claims were inadvertently allowed in paper no. 8, however, page one (1) of paper no.8 indicates that these claims were subjected to a restriction. Claims 29 and 30 are still subject to a non-elected invention.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1, 2, 3, 7, 8, 9, 10, 11, 28, 35, 36, 37, 38 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai, U.S. Patent 5,235,204 in view of Wolf, "Silicon Processing For The VLSI ERA", vol. 2 (Process Integration), Lattice Press, 1990, pp. 116-117 & 126-127.
7. Pertaining to claims, 1, 7, 8, 9, 10, 28, 35, 36, 37, 38 and 39, Tsai discloses a semiconductor process substantially as claimed. See **FIG. 6**, where a method of making an emitter contact for an emitter region of a bipolar transistor is disclosed. Tsai discloses a polysilicon structure 60 over an emitter region position of a semiconductive substrate (not numbered). However, the metal emitter contact is not formed by cross diffusing the metal and a portion of the polysilicon structure. Wolf teaches the use of a doped polysilicon sacrificial barrier in the fabrication of contacts and interconnects (pp. 126). A thin layer of doped polysilicon can be used to separate the Al and the single-crystal Si substrate (Fig. 3-28). After the Al:Si alloy film as been patterned, the contact structure is annealed (pp.127). In view of Wolf, it would have been obvious to one of ordinary skill in the art to form the metal emitter contact of Tsai by cross diffusing the metal and a portion of the polysilicon structure, because this process alleviates the problem of junction spiking (pp. 116).

8. Pertaining to claim 2, Tsai discloses an emitter region 40 as seen in FIG. 6.

However, in the absence of new or unexpected results, the mere reversal of the order of performing process steps has been held to be prima facie obvious. In re Burhans, 154 F.2d 690, 69 USPQ 330 (CCPA

1946).

9. Pertaining to claim 3, Tsai discloses that the emitter region 40 is polysilicon and metallurgy level being aluminum, which is obviously a doped layer (p-type) that will outdiffuse into the polysilicon region when annealed.

10. Pertaining to claim 11, Tsai discloses that the metal layer 64, can be aluminum.

11. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai, U.S. Patent 5,235,204 in view of Wolf, "Silicon Processing For The VLSI ERA", vol. 2 (Process Integration), Lattice Press, 1990, pp. 116-117 & 126-127, as applied to claims 1-3 and 7-11 above, and further in view of Aboelfotoh et al., U.S. Patent 5,801,444.

The combined teachings of Tsai in view of Wolf discloses a semiconductor process substantially as claimed as discussed above. However the combined teachings fail to disclose a polysilicon layer that includes polysilicon and germanium. Aboelfotoh discloses a semiconductor process wherein germanium is included with silicon for the purpose of making electrical contacts. See FIG. 11, where germanium (11) is deposited with polysilicon for the purposes of a contact for a semiconductor device. In view of Aboelfotoh it would have been obvious to one of ordinary skill in the art to include germanium with polysilicon for contact

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formation because a substantial advantage to be gained is that electrically stable contact metallization (column 5, lines 49-51).

12. Claims 4, 5 and 34 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 112

13. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

14. Claims 1-28 and 32-39 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: how the metal or where the metal is formed to perform the cross-diffusion step as claimed in independent claims 1, 12, 18, 20, 23, 28, 32, 33, 35 and 39.

Correction is required.

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to W. David Coleman whose telephone number is 703-305-0004. The examiner can normally be reached on 9:00 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on 703-308-4918. The fax phone numbers for the

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organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7721 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

WDC

October 15, 2001

L. Ph
LONG PHAM
PRIMARY EXAMINER